

8.2

The Nature of
Covalent Bonding

> Coordinate Covalent Bonds

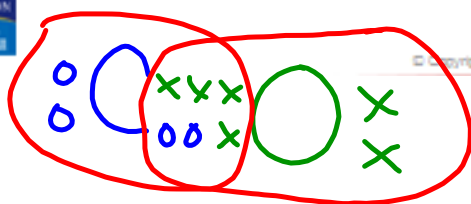
A **coordinate covalent bond** is a covalent bond in which one atom contributes both bonding electrons.

CO



Ex Carbon
monoxide

→ a structural
diagram
does NOT
work.



oxygen
is "more
generous" with electrons

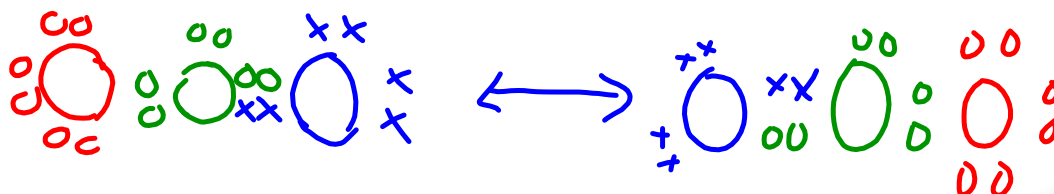
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The Nature of
Covalent Bonding

> Resonance

A **resonance structure** is a structure that occurs when it is possible to draw two or more valid electron dot structures that have the same number of electron pairs for a molecule or ion.

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The Nature of
Covalent Bonding

> Exceptions to the Octet Rule



The octet rule cannot be satisfied in molecules whose total number of valence electrons is an odd number.

There are also molecules in which an atom has fewer, or more, than a complete octet of valence electrons.

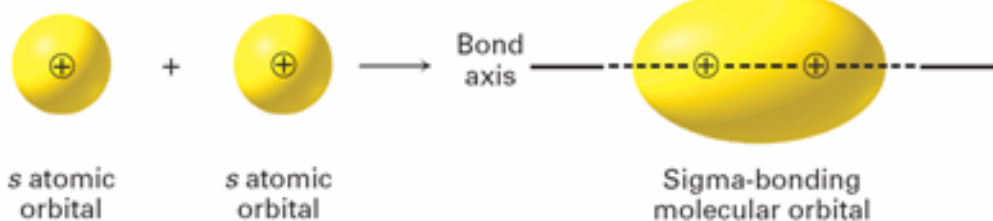
Sigma Bonds



When two atomic orbitals combine to form a molecular orbital that is symmetrical around the axis connecting two atomic nuclei, a sigma bond is formed.

A Sigma Bond

⊕ represents the nucleus.



S orbital S orbital

Sigma bonding molecular orbital

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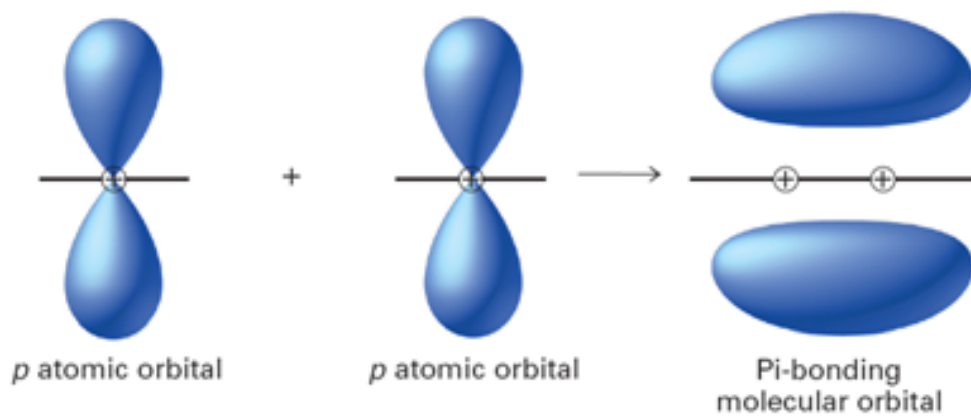
Bonding Theories > Molecular Orbitals

Pi Bonds

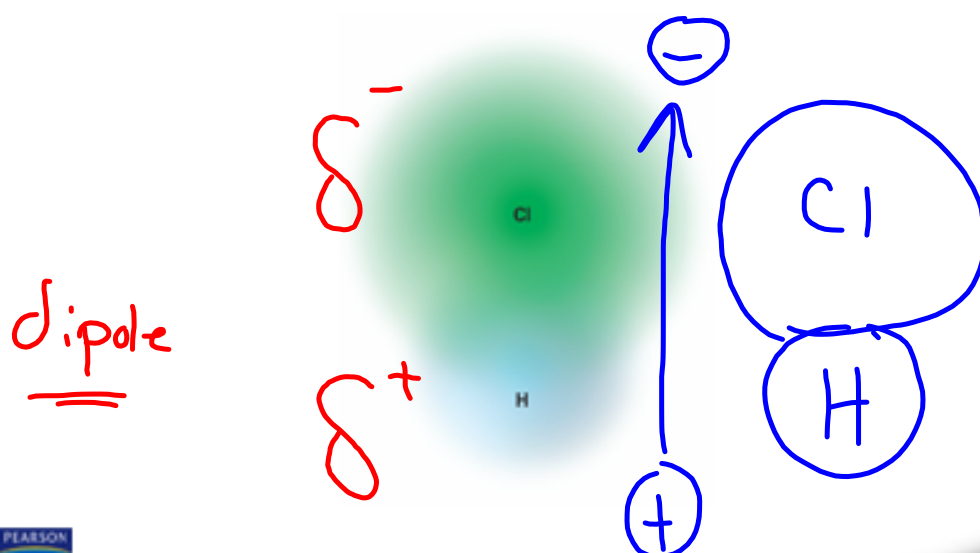
In a **pi bond** (symbolized by the Greek letter π), the bonding electrons are most likely to be found in sausage-shaped regions above and below the bond axis of the bonded atoms.

Pi-bonding Molecular Orbital

⊕ represents the nucleus.



The chlorine atom attracts the electron cloud more than the hydrogen atom does.



8.4 Polar Bonds and Bond Polarity

Table 8.3**Electronegativity Differences and Bond Type**

Electronegativity difference range	Most probable type of bond
0.0–0.4	Nonpolar covalent
0.4–1.0	Moderately polar covalent
1.0–2.0	Very polar covalent
≥ 2.0	Ionic